

LEATHERBACK POPULATION SIZE, RECRUITMENT, REMIGRATION, AND MORTALITY FOR ST. CROIX, USVI.

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The St. Croix nesting population of leatherback turtles has increased since intensive conservation and monitoring efforts began in 1981. However, it has been difficult to assess whether this is due to increased survival of adults or recruitment of new nesters, since flipper tag loss is extremely high in leatherbacks. Consistent use of photoidentification since 1987, and PIT tagging since 1992 has supplemented flipper tags and allowed reliable identification of remigrants, even those that lose all flipper tags between nesting seasons (see McDonald & Dutton 1996), and enabled a preliminary assessment of adult mortality and recruitment in this nesting population.

The Objectives of this contract were to update the tag database for the St. Croix and regional leatherback nesters (developed in 1997), update and analyze the "pink spot" photo catalog in order to evaluate PIT tag retention, and establish a comprehensive database to determine population numbers, recruitment, remigration and nester survivorship estimates. I included data collected through the 2001 nesting season.

IDENTIFICATION

A combination of metal flipper tags, photoidentification of the pineal spot, or "pink spot", and PIT tags were used to identify individuals. High flipper tag loss between nesting seasons (nearly 50% some seasons) prompted the use of photo id as a secondary identification technique. Beginning in 1992, each individual has been injected with a PIT tag. Using these three methods combined, I am confident that remigrants can be accurately identified.

It was previously thought most turtles are only seen on a nesting beach during one season. These improved identification techniques have shown that on Sandy Point, the majority (69%) are seen again in subsequent seasons. In some seasons, nearly 33% of untagged (= no flipper tags) turtles have been identified as remigrants using photo id and PIT tags. A total of 588 leatherbacks has been tagged since 1977. While the longest remigration interval was 11 yrs, most remigrants (98%) returned to nest within 5 years (Figure 1).

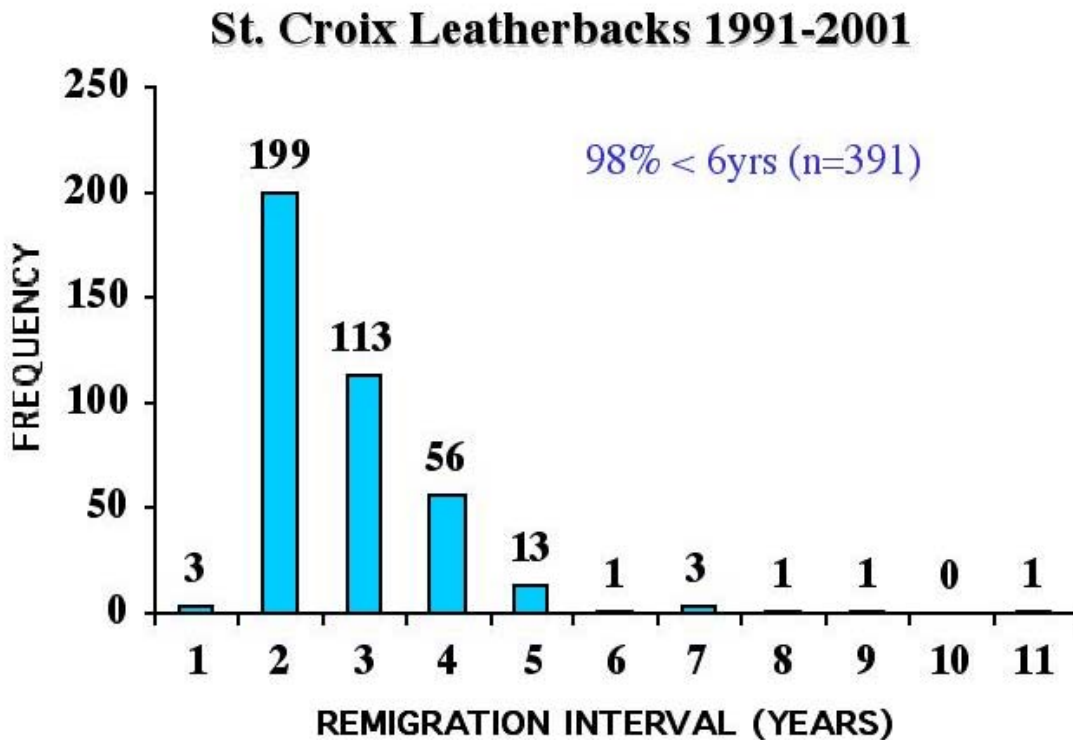


Figure 1. Remigration intervals observed for leatherbacks nesting on St. Croix since 1991 ($n=391$), using a combination of metal flipper tags, photoidentification and PIT tags to identify individuals.

PINK SPOT CATALOG

I updated the pink spot photo catalog to include photos taken through 2001, and analyzed photos of “new turtles” (i.e. those with no flipper tags or PIT tags) that had tag scars indicating possible remigrants. I identified one turtle that was PIT tagged in 1996, and returned to nest in 1999 with no flipper or detectable PIT tag. This indicates that photo identification is still a useful backup method for identifying remigrants and for verifying PIT tag retention.

PIT TAG RETENTION

Based on available information, I estimate PIT tag retention to be close to 100%. Out of 477 PIT tags applied since 1992 on 439 leatherbacks, there have been 326 resightings, with 365 PIT tags detected on those remigrants. (This does not represent the total number of PIT tags initially applied that were detected in later seasons, since some of these turtles (and tags) were recorded during more than one subsequent season.) Of these, 100 had lost all flipper tags. Tag loss or failure was confirmed in only three cases, and it is possible that all of these were lost at or soon

after tagging. In one case, the turtle reacted violently to PIT tagging so the tag was likely not injected properly; later that season the tag could not be detected. In another, the turtle was not seen again during the season in which it was tagged, so the tag was not verified. In the third, the turtle was seen once more but was not scanned.

Proper technique and well-maintained appropriate equipment are essential to a successful PIT tag program. The turtle's tissue may reject the tag if it is improperly injected; for instance, if sand is injected along with the tag, or if the turtle is moving at the time of injection which could result in too-shallow application. The tag must be injected into the muscle tissue, not just under the skin, using a needle at least 1 1/2 inches long (McDonald and Dutton 1996).

We used AVID tags and scanners, including the original standard model, and Power Tracker II and IV. We did not use the smaller AVID "pocket" scanner, which does not have the scan range necessary for use in leatherbacks. We found that scanning technique and battery power affected tag detection. The tag should be perpendicular to the scanning surface, so the scanner should be "rocked" in different directions when scanning a turtle to account for slight tag migration or position differences. Also, tags were sometimes not detected during one nesting period, but were then detected later in the season. Low battery power resulted in missed tags.

In conclusion, PIT tags are the best method of long-term identification of leatherbacks, making photoidentification obsolete on St. Croix. However, photoidentification should continue to be maintained as a backup method and used as an independent method to evaluate long-term PIT tag retention.

NESTER SURVIVAL ESTIMATES

"Apparent" mortality was estimated from the percentage of turtles tagged in a given year that were not seen again within a minimum of 5 years. If a turtle was observed nesting elsewhere, but did not nest at Sandy Point, it was not counted as dead. On average, about 31% are never seen again (Figure 2); i.e., apparent survival is about 79%. The limitation to this approach is that this overestimates actual mortality as it fails to take into account temporary emigration. Turtles tagged at Sandy Point have been observed nesting on other nearby beaches; i.e., Puerto Rico mainland and the islands of Culebra and Vieques as well as other beaches on St. Croix. However, there has not been consistent coverage of these beaches, so that many possible emigrants have not been detected.

**LEATHERBACKS AT US VIRGIN ISLANDS:
PROPORTION OF ANNUAL NESTING COHORT NOT SEEN
AGAIN WITHIN 4-18 YEARS**

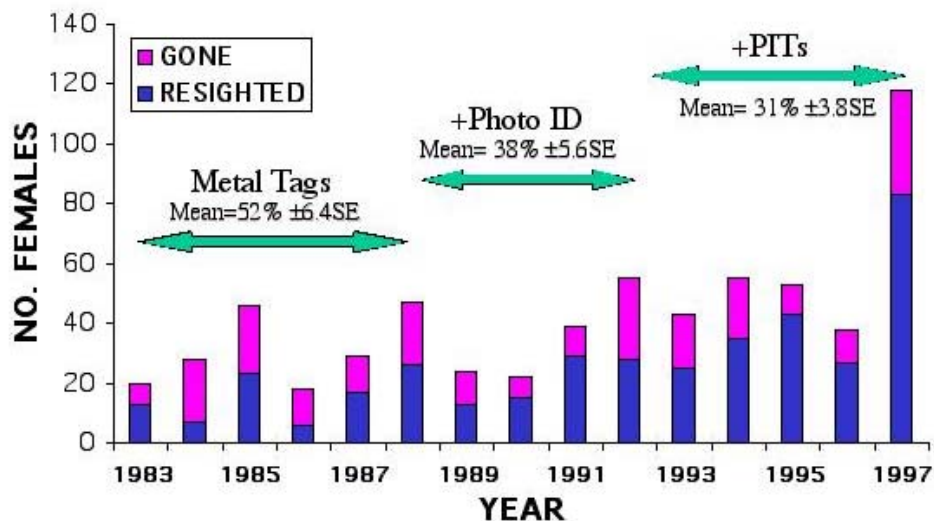


Figure 2. Proportion of leatherbacks nesting on St. Croix each year that were not identified again in subsequent years. From 1983-1987 only metal tags were used to identify turtles, from 1988-1991, a combination of metal tags and photo-ID, and since 1992, PIT tags, Photo-ID and metal tags combined have ensured that remigrants are reliably identified. Since most turtles renest within 4 years, this is the minimum time frame used.

The analysis completed through this contract provides a database of sufficient quality to apply new modeling techniques that estimate nester survivorship and abundance while accounting for temporary emigration and variable remigration intervals. Further modeling work is underway in collaboration with other researchers, with manuscripts *in prep* and *in press* (see Dutton et al, *in press*, attached).

Using this model, survival of the Sandy Point nesters is estimated to be at least 89% (Dutton et al., *in press*, attached). This is consistent with the rapid nesting population increase observed on St. Croix in recent years, however, to validate this model and obtain a more accurate picture of this population we must treat it as a regional management unit and obtain consistent information on the other nearby nesting beaches, like those of Puerto Rico, which we have already established “share” turtles with Sandy Point. Coverage on these other beaches has not been sufficient to obtain accurate population and survival estimates for this regional stock. Simultaneous saturation coverage of the primary nesting beaches (St. Croix, Culebra including

Brava and Resaca, Vieques, and mainland Puerto Rican beaches) is necessary to achieve this.

REFERENCES

- Dutton, D.L., P.H. Dutton, R. Boulon, W.C. Coles, and M.Y. Chaloupka. *In press*. New insights into population biology of leatherbacks from 20 years of research: profile of a Caribbean nesting population in recovery. 2002 Sea Turtle Symposium.
- McDonald, D.L., and P.H. Dutton. 1996. Use of PIT tags and photoidentification to revise remigration estimates of leatherback turtles (*Dermochelys coriacea*) nesting on St. Croix, U.S. Virgin Islands, 1979-1995. *Chelonian Conservation and Biology* 2(2):148-152.